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Patentanmeldung Nr. | Patent application No. | Demande de brevet n°

04075002.8

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Der Präsident des Europäischen Patentamts;
Im Auftrag

For the President of the European Patent Office

Le Président de l'Office européen des brevets
p.o.

R C van Dijk

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Anmelder/Applicant(s)/Demandeur(s):

Koninklijke Philips Electronics N.V.
Groenewoudseweg 1
5621 BA Eindhoven
PAYS-BAS

Bezeichnung der Erfindung/Title of the invention/Titre de l'invention:
(Falls die Bezeichnung der Erfindung nicht angegeben ist, siehe Beschreibung.
If no title is shown please refer to the description.
Si aucun titre n'est indiqué se referer à la description.)

Hard disk/DVD combi record

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Hard disk/DVD combi recorder

Field of the invention

The invention relates to a storage device for storing content, the storage device having time shift functionality. The invention further relates to a method of storing content on a storage device. The invention further relates to a computer program product for implementing the above method.

Background of the invention

A combi recorder is a product that records analog video on a hard disk and offers options for archiving recorded programs (titles) to a DVD. Furthermore it has extended time shift features and supports navigation in the past. Traditional video recorders cannot record and playback at the same time. Hard disk recorders may have time shift features but do not allow programmes that were broadcast in the past to be recorded.

Object and summary of the invention

The key features of the combi recorder ("set") according to the invention are:

- Continuous recording and time shifting
- Simultaneous recording and playback
- Title editing
- Title playback
- Faster than real time archiving to DVD
- Automatic clean-up of the hard disk
- Table of contents

All these features are outlined below.

List of figures

Figure 1 shows an example of a screen representation of a time shift buffer.

Figure 2 shows a further example of a screen representation of a time shift buffer.

Figure 3 shows a detailed screen representation of a time shift buffer.

Figure 4 shows a further example of a screen representation of a time shift buffer.

Figure 5 shows a further example of a screen representation of a time shift buffer.

Detailed description of embodiments

Continuous recording and time shifting

One key feature of the combi recorder is that it is always recording. It can record from camera, but usually it records the live TV signal. The combi recorder follows the zapping behaviour of the user and records what is being watched. The last *n* hours (n = 1, 2, 3, 6) of what is being watched are recorded, allowing the user to save programmes afterwards. The set records into a so-called continuous buffer; the recorded material (say it is video only) flows into the buffer, while video that was recorded *n* hours ago will be discarded (flows out). Each zap and each programme change[1] signals the beginning and end of a title in the continuous buffer.

The continuous buffer is graphically presented on the screen as a bar with markers that indicate the title boundaries. Such a bar is called the Time Shift Bar or TSB. The TSB represents the last *n* hours of what was recorded. One pixel in the TSB represents *m* seconds of recorded material (m = 10, 20, 30 or 60 seconds). A playback pointer shows the position in the TSB in real time.[2]

The TSB contains a number of titles, separated by title markers. The titles in the TSB have a certain color that reflects the genre (e.g. movie, sport, kids, etc).

The video being played back is shown behind the TSB. The TSB will disappear after a time out when the set is in normal play mode. With trick modes the TSB remains visible.

There are various ways in which the user can navigate in the TSB:

- Jump to title markers using dedicated keys on the remote control.

[1] Programme changes are reported by the EPG or by Teletext

[2] Say that the TSB shows the recorded material from 16:00-19:00. When the playback pointer is positioned at 17:45, it indicates what was recorded at that time.

- Use the left/right arrow keys to navigate pixel-by-pixel. There is an algorithm that accelerates the movement of the playback pointer when a left/right arrow key is held down. The idea is to cover the entire buffer in a reasonable time.
- Use the up/down arrow keys to select the previous or next title in the TSB.[3]
- Starting playback from the beginning of a title can be done with one (soft) key. Just position the playback pointer anywhere in the title and press "play from start".
- Titles can be saved (i.e. prevented from being lost when they fall off the buffer) by a single key press. Saving parts of a title can be done as well, but with multiple or long key presses.
- The "Smart-OTR" feature marks successive titles in the TSB for saving with a repeated single key press.
- When playing fast forward or otherwise navigating and the end of the TSB is reached, the system shows the live TV signal again ("catch-up" mechanism).

A few words about zapping and title markers: when the user quickly zaps along channels and the set follows the zapping behaviour, then that would result in many very small titles that not only cannot be represented properly, but are also useless to the user. Therefore, the title markers are only set if the set is tuned to the same channel for a certain period of time. A complicating factor is the programme change information, provided by the EPG. Normally, a title marker would be inserted at each programme change. However, if the programme change occurs immediately after the zap, then that would also result in a very small title. Provisions have been taken to prevent that.

Similarly, if an extended TSB screen (overview screen) is shown which displays the details of the already recorded programs, then zapping immediately shows the full programme details. If the user zaps away within the time out period, the programme details are replaced.

To complicate matters even further: when the users is on channel X and zaps to channels Y, Z and then back to X, no title marker is inserted; the system detects that it is now on the same channel.

In summary the combi according to the invention may provide the following features:

- Setting the title markers when zapping quickly

[3] It is possible to show an extended overview of the TSB where the titles are listed in a vertical list. As the up/down arrow keys can be used there to navigate through that list, they can be used in the standard TSB as well.

- Setting title markers when programme changes occur shortly after a zap
- Showing and hiding full programme details in an extended overview when zapping quickly
- Recognizing programmes after quickly zapping away and back
- Accelerating arrow keys
- Graphical representation of the continuous buffer (the TSB)
- Marking programmes for saving, including Smart-OTR
- When watching live TV, it is possible to review a scene, i.e. "rewind" while still continue recording

Simultaneous recording and playback

- As the combi recorder is always recording, it is able to simultaneously record and playback. Playback in this context comprises:
- Playing back a previously recorded title from hard disk
- Playing back a (pre-recorded) DVD
- Playing back a title that is still in the TSB
- Playing back a title that is currently being recorded
- Archiving a (batch of) title(s) from the hard disk to DVD

Title editing

A title can contain chapters[4]. Chapters are separated by chapter markers. When recording a title, chapter markers can be added automatically, e.g. every five minutes or, more desirable, at every scene change in the footage. (When recording from a digital camera, the chapter markers are actually generated based on the recording dates and times.)

Title editing comprises:

- Changing the title name
- Changing the genre (e.g. movie, sports, news, etc)
- Inserting and deleting chapter markers
- Hiding and showing chapters
- Selecting a key frame
- Dividing the title in two parts
- Changing the "seen" status of a title

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4 A chapter is nothing more than a part of a title.

Chapter markers can be inserted at any point in the title. Entire chapters (the part between two markers) can be "highlighted", which means they are shown or hidden (i.e. not shown) when the title is played back.

A key frame is used to visually represent the title in the Table Of Contents (TOC). A key frame is selected automatically from the footage by the system, using a certain algorithm (similar to generating a key frame on DVD recorders). The user can select another screen shot as the key frame.

A title is marked as "seen" when it has been playing for more than 85%. This indication is used in automatic disk cleanup.

When editing, an editing bar is shown that represents the title. The chapter markers are shown and the chapters that are hidden are presented in a different color. When playing back the title, the video of the hidden sections is dimmed or is otherwise indicated as being "not shown during playback". There is an algorithm to zoom in and out of the editing bar so that the resolution changes from 10-60 seconds per pixel to 1 second per pixel.[5]

Navigating in the editing bar can be done in the same way as with title playback.

Title playback

A title, be it a previously recorded title or a title that is still in the TSB, can be played back. When playing back a title, the user is presented with a playback bar that represents the title. When chapters are hidden, then they are not shown in the playback bar and they are not played. It is as if those chapters do not exist. Chapter markers are shown in the playback bar.

Navigation in that playback bar comprises:

- Jump to chapter markers
- Skip a user-defined number of seconds[6]
- Move pixel-by-pixel and accelerate when the arrow key is held down
- Move frame by frame, even though the resolution of the playback bar is 10 seconds per pixel at best
- The normal trick modes: fast and slow forward and backward

[5] Although the resolution of the editing bar is x seconds per pixel, it is still possible to find an exact screen shot by stepping through the video material. The arrow keys step one pixel, but e.g. when the video is paused, pressing the Pause key steps one frame.

A few words on jumping: when jumping to chapter markers or for a predefined number of seconds, the play mode is resumed. In other words, when the set was playing fast forward, then it resumes playing fast forward after a jump. That is the expected behaviour, but poses some problems when jumping against the play direction. Suppose the user is playing fast forward and presses "jump to previous marker". Then the play mode would be resumed and the next "jump to previous marker" would go back to that same marker. There are several ways to circumvent that:

- Pause the video for a predefined number of seconds before resuming the play mode. This gives the user time to repeat the command.
- Skip the just visited marker when the same jump key is pressed again within a certain period of time.
- Hold down the jump key and wait at each marker for a certain period of time. This gives the user time to release the key in time.

Archiving

Archiving is the process of writing a (batch of) title(s) from the hard disk to a DVD. The user can indicate where the to-be-archived titles must be stored on the DVD, i.e. indicating which previously archived titles may be overwritten. Alternatively, the to-be-archived titles can be appended to the end of the DVD. The system will find out if there is enough space on the DVD before the archiving starts. When archiving is in progress, an OSD indicates how much longer the process takes, i.e. it counts down to 0, at which time the archiving process is estimated to be completed. In the mean time, the user can watch the live TV signal and can zap, but cannot time shift.[7]

Cleanup of the hard disk

If the set runs out of disk space, it automatically deletes titles from the hard disk. The algorithm used is that the oldest titles are deleted first, starting with the titles that have already been watched by the user ("seen" property). Titles can be protected from deletion by setting them to "protected" from the Table Of Contents.

Table Of Contents

The Table Of Contents (TOC) is a list of titles that are on the hard disk. Titles that are still in the TSB and are marked for saving are also in the TOC.

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[6] Intended to skip the commercials :-). Skipping forwards and backwards can be with different intervals.

[7] Time shifting would mean playing back two titles simultaneously: one from the time shift buffer and the one that is being archived. Our system cannot do that (yet).

Titles can be sorted in several ways:

- Alphabetically
- Chronologically (i.e. by recording date)
- Last played
- In the order in which they will be deleted
- And the title list can be filtered in several ways by just showing the :
- Protected titles
- Titles with a certain genre
- Unseen titles
- Titles that will be deleted (the list is sorted chronologically as well)

In fact, the filtered list could also be sorted with a user-defined method. That is not the case right now; filters each have their own sorting method.

Titles have to be "selected" in the TOC and then an operation can be chosen by the user. Such operations include delete, archive, child lock, protect.

Applications of the invention

The combi recorder can be used as a replacement for the traditional VCR or DVD recorder because it has more sophisticated features.

CLAIMS:

1. A storage device for storing content, the storage device having time shift functionality, the storage device being characterized in accordance with the description and figures in this patent application.

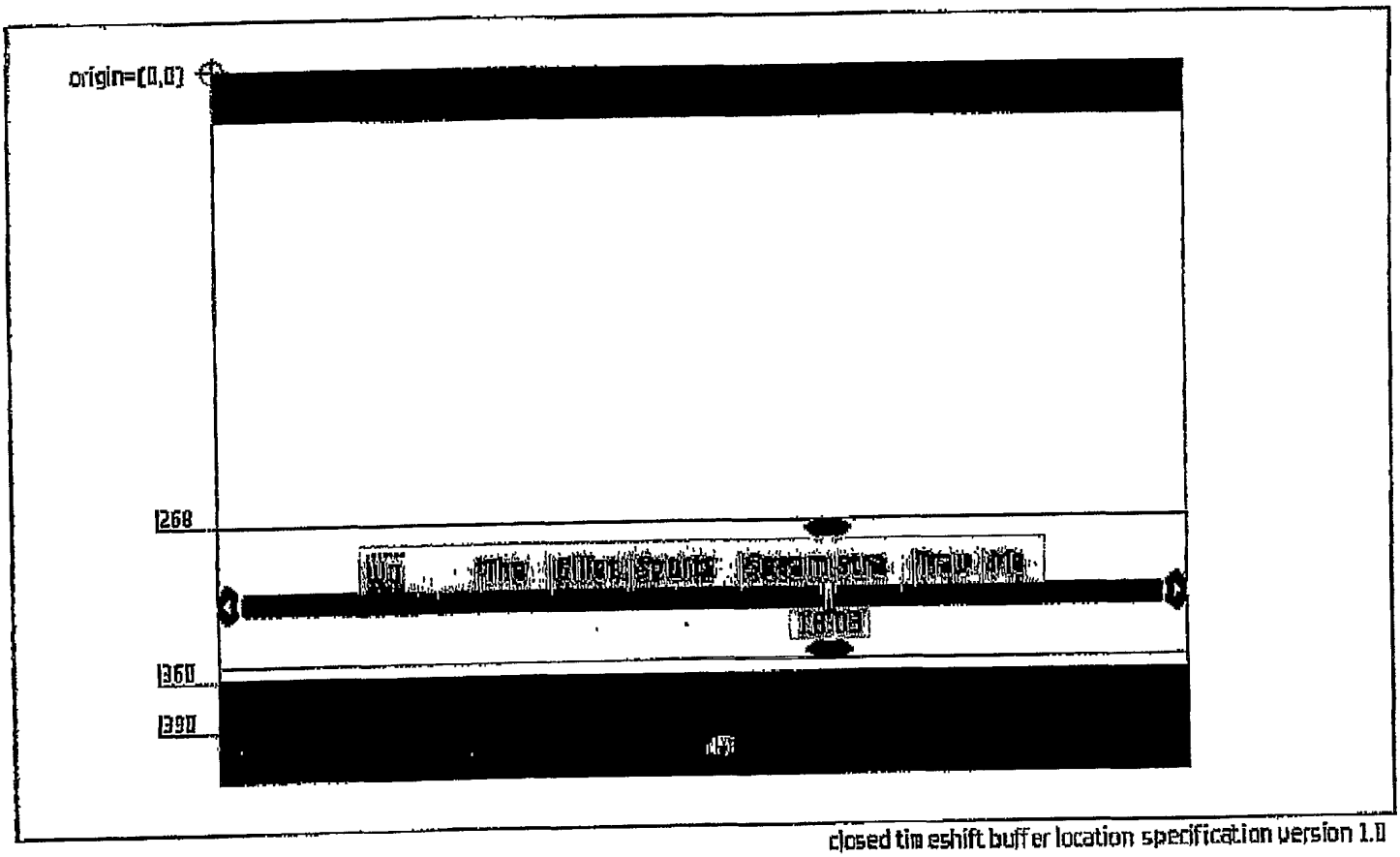
2. A method of storing content on a storage device characterized in accordance with the description and figures in this patent application.

3. A computer program product for implementing the above method.

ABSTRACT:

A combination of a hard disk video recorder with archiving possibilities, time shift features and navigation in the past.

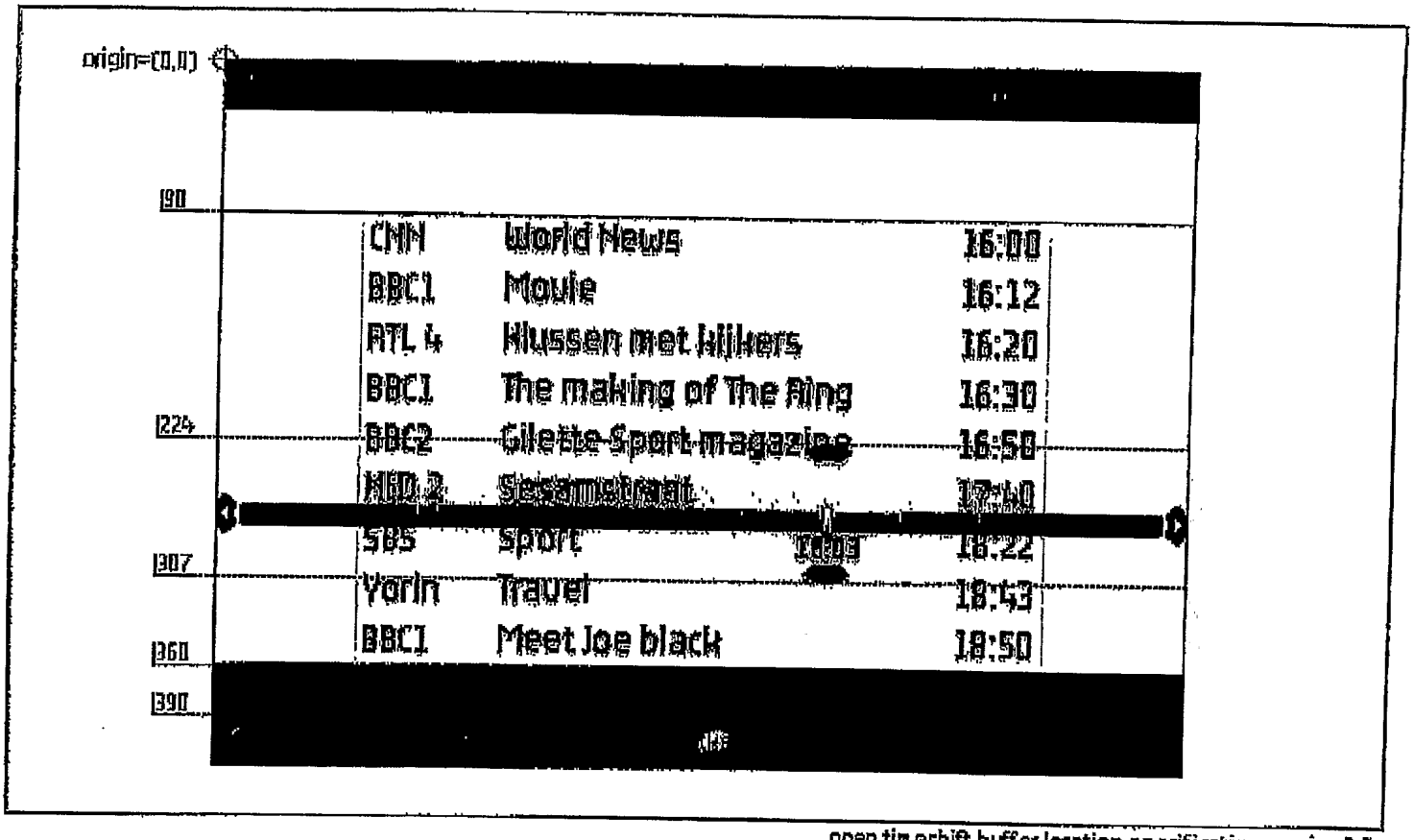
Fig. 3



closed timeshift buffer location specification version 1.0

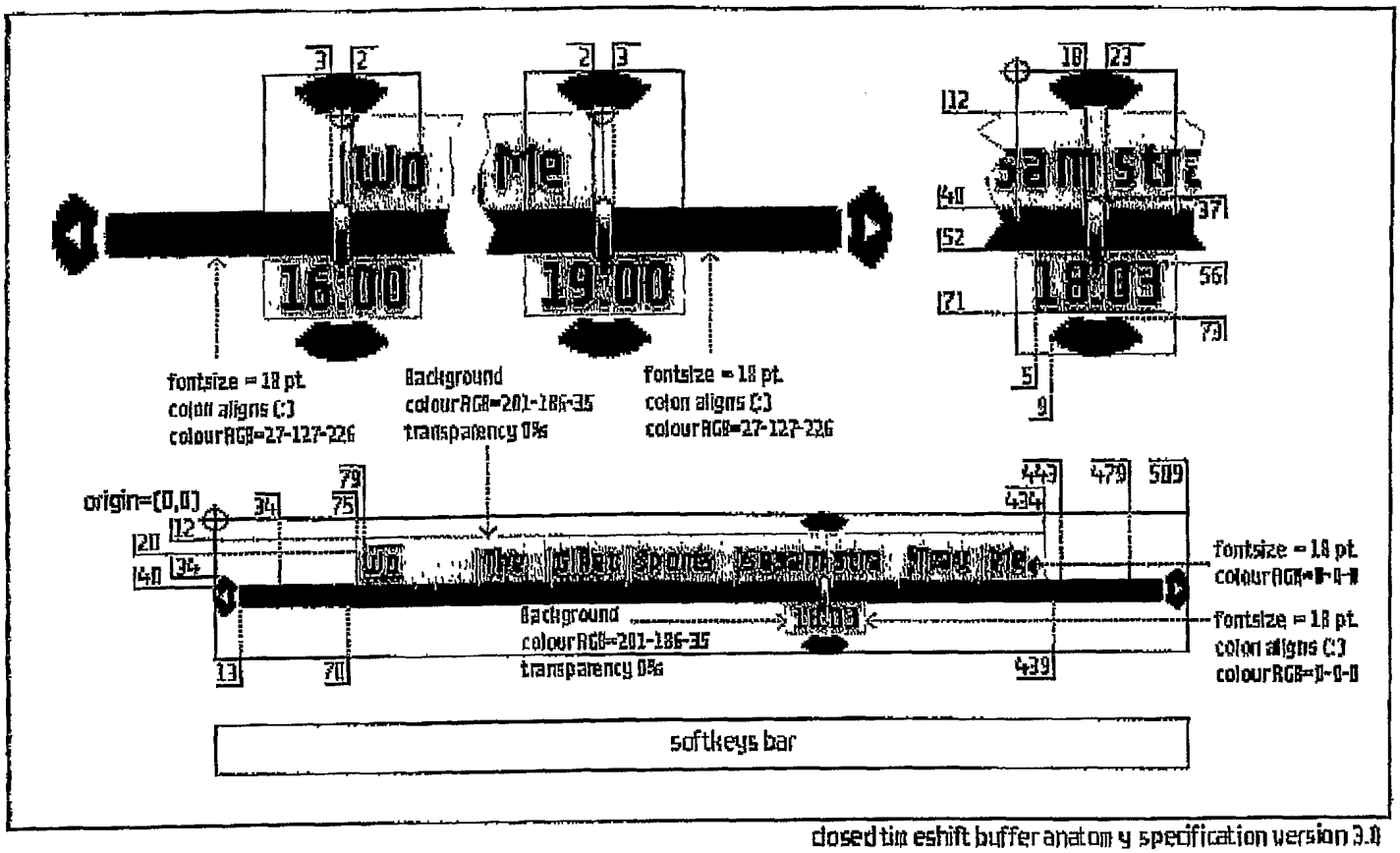
Fig 1

2/5



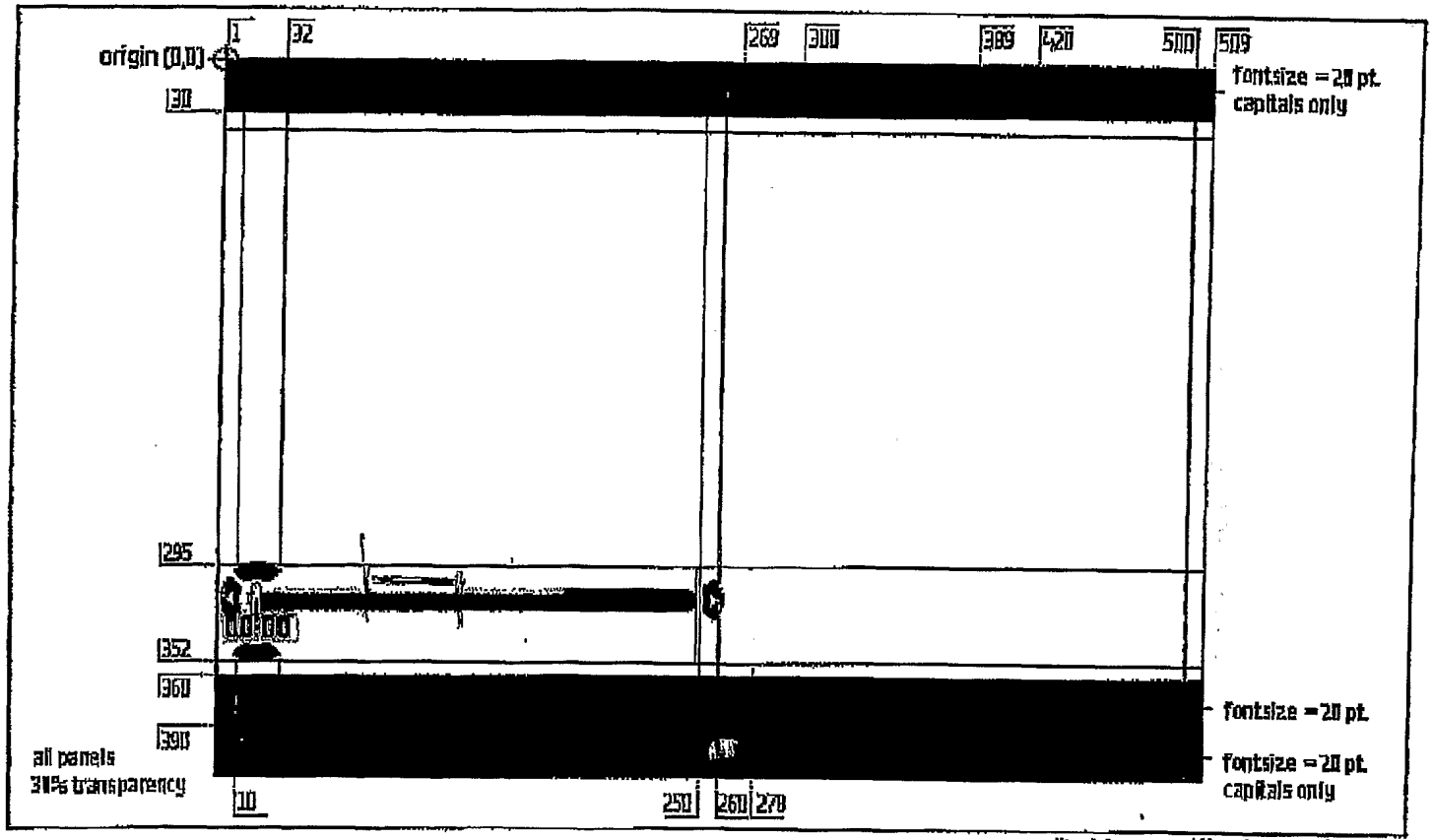
open tim eshift buffer location specification version 2.0

Fig 2



closed timeshift buffer anatomy specification version 3.0

Fig 3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269
300
389
420
500
509
30
fontsize = 20 pt.
capitals only
295
352
360
390
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fontsize = 20 pt.
capitals only
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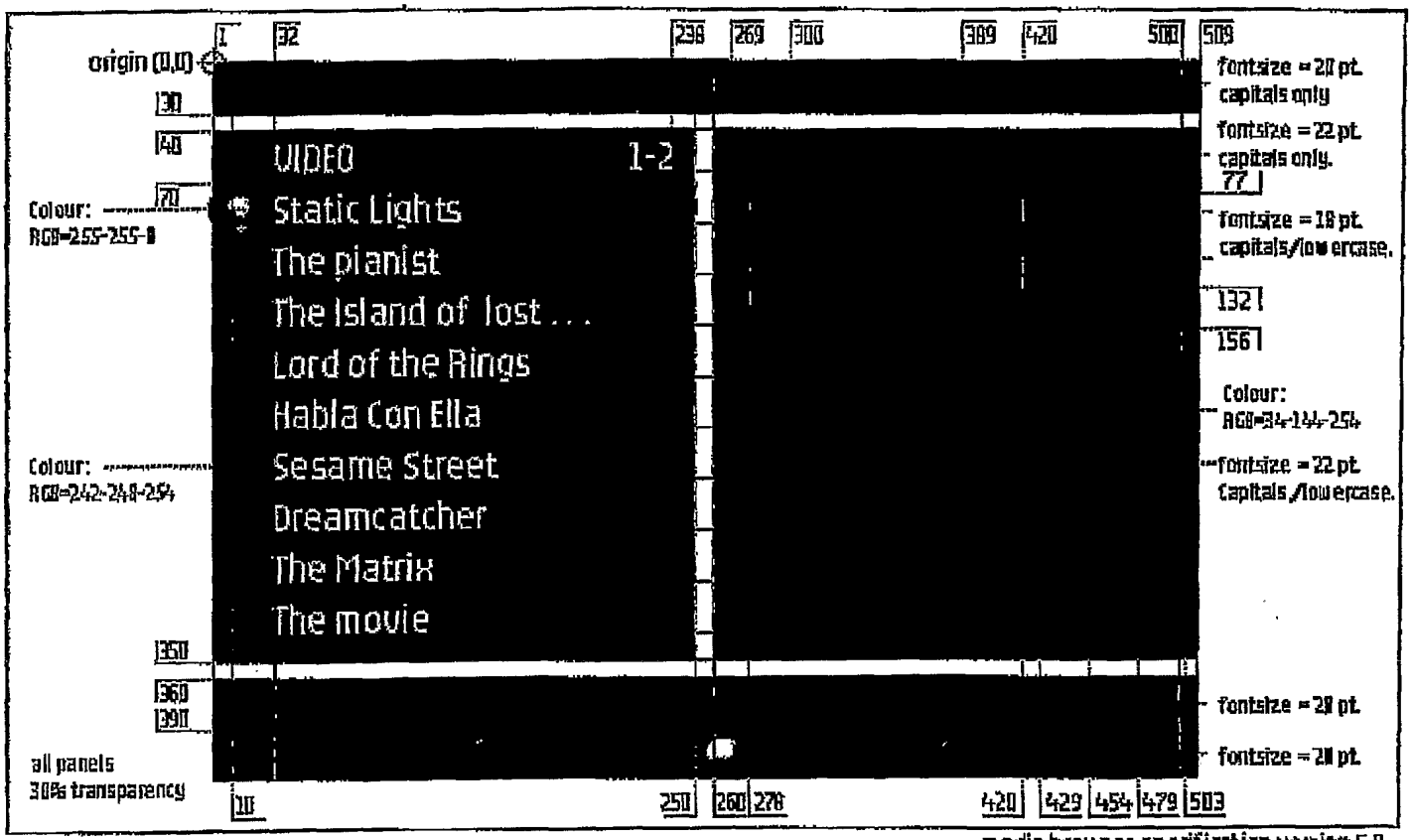
30% transparency
10
250
260
270
edit video specification version 2.0

Fig 4



media browser specification version 5.0

Fig 5

PCT/IB2005/050070